



**WYOMING
DEPARTMENT OF
TRANSPORTATION
2017 WORK PROGRAM**

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INTRODUCTION

The Wyoming Department of Transportation Research Work Program is prepared in accordance with federal statutes, rules and regulations, and FHWA requirements. Work Program is defined in *Title 23 C.F.R Part 420, Sec. 103* as:

...a periodic statement of proposed work, covering no less than one year, and estimated costs that document eligible activities to be undertaken by State DOTs and/or their subrecipients with FHWA planning and research funds.

Title 23 C.F.R Part 420, Sections 111, 207 and 209 sets out that the Work Program should consist of a) a list of and description of the work and/or activities to be accomplished during the program period; b) an estimated cost for each eligible activity; c) a description of any cooperatively funded activities that are part of a national or regional pooled study, including the NCHRP contributions; and d) financial summaries which show the funding levels for each activity, which should include the federal and state share, and any matching funds for each individual project. *Subpart (c), of Title 23 of the Code of Federal Regulations, Section 420.209*, requires research programs certify that their program conforms to management processes.

Research project proposals are reviewed by the Research Advisory Committee (RAC), and forwarded to Executive Staff and FHWA for funding approval. The RAC reviews, evaluates, and prioritizes all research development and technology transfer proposals and problem statements. The RAC convenes quarterly (October, January, April, and July),¹ and at other times as deemed necessary. During the quarterly meetings, the RAC reviews proposals for their merits; reviews the progress of current research projects to ensure they are timely and within budget; and reviews all innovative research projects for possible implementation. Because the RAC membership is in addition to a member's normal workload, the Research Center rotates membership through senior staff position. Two district staff engineers and five program managers serve on the RAC each year. Membership on the RAC is by position and not by person. In the event a position is vacant, the new person hired for that position assumes the RAC duties for the remainder of that rotational period.

Proposals for and descriptions of current/active research projects can be found on the WYDOT Research Center website.² Final reports for all closed research projects from 2009 forward are also archived on the WYDOT Research Center website.³ Research reports for projects between the years of 1969 to 2009 can be obtained by contacting the Research Center.

¹ WYDOT, *Operating Policy 4-1(II.C)*

² http://www.dot.state.wy.us/home/planning_projects/research-center/current-research-projects.html

³ http://www.dot.state.wy.us/home/planning_projects/research-center/final-projects-fy2009-to-fy2013.html

Title 23 C.F.R. SEC. 420.209
CERTIFICATE OF COMPLIANCE

I, Keith Fulton, Assistant Chief Engineer for the Engineering and Planning Division, do hereby certify that the State is in compliance with the requirements of *23 C.F.R. 505*, and its implementing regulations with respect to the research, development, and technology transfer program, and contemplate no changes in statutes, regulations or administrative procedures which would affect such compliance.



Keith R. Fulton, P.E.

Assistant Chief Engineer for Engineering and Planning

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Chapter 1. 2017 Budget Summary

This chapter sets out the proposed budget for fiscal year (FY) 2017⁴.

1. SP&R Funds	\$5,100,000
REVENUE	
2. SP&R RES Funds	\$1,303,851
3. LTAP Special Allocation (Fund 438)	\$125,000
4. FY2016 unobligated funds	\$265,510
5. Total Revenues	\$1,694,361
EXPENSES	
6. NCHRP	\$258,330
7. TRB Correlation Service (est.)	\$85,000
8. Technology Transfer to U.W. Fund 438	\$125,000
9. LTAP Funds RS01217	\$30,000
10. Administrative Costs (est.)	\$138,959
11. Pooled Fund	\$0.00
12. State Research Projects (80% federal)	\$0.00
13. ICAP funds (80% federal) (est.)	\$75,000
14. Total Expenses	\$712,289
TOTAL FY2017 FEDERAL FUNDS AVAILABLE	\$982,072

LINE NUMBER EXPLANATIONS:

1. Total *estimated* 2017 SP&R funds.

REVENUE

2. Under 23 U.S.C. 505(b)(1), at least 25 percent of the SPR funds must be used for research, development, and technology transfer activities. WYDOT presently obligates the minimum amount, which is made up of 100 percent Federal funds, i.e., 25 percent of line 1.
3. See Local Technical Assistance Program (LTAP) & Technology Transfer (T²) Center summary for a complete financial breakdown.
4. Un-obligated Federal funds from previous fiscal year apportionments.
5. Summation of lines 2 through 4.

EXPENSES

6. Under *Section 124 of the 1987 Surface Transportation and Uniform Relocation Assistance Act (STURAA)*, 5.5 percent of SP&R funds can be contributed to NCHRP. WYDOT presently contributes the full 5.5 percent, which is made up of 100 percent Federal funds. TPF-5(109).
7. The TRB Correlation Service is a pooled fund and obligated annually using 100 percent Federal funds. TRB-5(277).

⁴ The funds set out in this budget summary are a guesstimate of the funds that will be available in FY 2017.

8. The Technology Transfer Center's funding (located at the University of Wyoming), is contracted for and obligated annually. See Technology Transfer (T²) Center summary for financial breakdown.
9. LTAP funding, is contracted and obligated annually. See Local Technical Assistance Program (LTAP) for financial breakdown.
10. Administrative Cost summary for financial breakdown.
11. Transportation Pooled Fund Projects summary for financial breakdown.
12. Federal funds only (80 percent of the contracted amount). See State Research Projects summary for financial breakdown.
13. Indirect Cost Allocation Plan (ICAP) funds (an additional 8.23 percent added on to each contract (80 federal/20 state split).
14. Summation of lines 6 through 14.

TOTAL

15. Total amount available for new research (revenue, less expenses).

Chapter 2. 2017 Expense Summary

2.1 National Cooperative Highway Research Program (NCHRP)

Identification: TPF-5(415)

Contacts: WYDOT Representative:
Tim McDowell, P.E.
307-777-4177
WYDOT Programming
5300 Bishop Blvd.
Cheyenne WY 82009

Funding: \$258,330

Scope: Administered by the Transportation Research Board (TRB) and sponsored by the member departments (i.e., individual state departments of transportation) of the American Association of State Highway and Transportation Officials (AASHTO), in cooperation with the Federal Highway Administration (FHWA), the National Cooperative Highway Research Program (NCHRP) was created in 1962 as a means to conduct research in acute problem areas that affect highway planning, design, construction, operation, and maintenance nationwide.

The state departments of transportation are the sole sponsors of NCHRP. Support is voluntary and funds are drawn from the states' Federal-Aid Highway apportionment of State Planning and Research (SP&R) funds. Furthermore, the funds can be spent only for the administration of problems approved on ballot by at least two-thirds of the states. Each state's allocation amounts to 5.5 percent of its SP&R apportionment and is set forth in supplementary tables issued with each year's Federal-Aid Highway apportionments.

The National Cooperative Highway Research Program is 100 percent federally funded, requiring no state match.

2.2 Transportation Research Board Correlation Service (TRB)

Also known as the Core Program Services for a Highway Research, Development, and Technology Program, 2017.

Identification: TPF-5(109)

Contacts: WYDOT Representative:
Tim McDowell, P.E.
307-777-4177
WYDOT Programming
5300 Bishop Blvd.
Cheyenne WY 82009

Funding: \$85,000 (est.)

Scope: The Research Correlation Service of the Transportation Research Board (TRB) of the National Academy of Sciences is subscribed to annually by WYDOT. Membership allows receipt of all major publications and input to various national research programs including NCHRP. In 2002, the FHWA authorized yearly payment of the TRB Correlation Service using the FHWA-administered pooled fund mechanism. Starting in FY1995, the FHWA allowed the TRB correlation service charge to be paid at 100 percent federal funding, requiring no state match.

2.3 Technology Transfer Center (T2) at University of Wyoming

Identification: LTAP(016)
 LTAP(017)
 FUND 438

Contacts:	Principal Investigator:	WYDOT Representative:
	Khaled Ksaibati, P.E., Ph.D	Tim McDowell, P.E.
	307-766-6230	307-777-4177
	University of Wyoming	WYDOT Programming
	Laramie WY 82071	5300 Bishop Blvd.
		Cheyenne WY 82009

Funding Summary:

<i>Code</i>	<i>Funds</i>	<i>State Portion</i>	<i>Federal Portion</i>	<i>Budgeted</i>
LTAP (0438)	Local Tech. Assistance		\$125,000	\$125,000
HPRF	(WYDOT) SP&R RES	\$31,250		\$31,250
SCFM	SC Fund (4 cent)	\$31,250		\$31,250
CCOF	Municipal & County	\$31,250		\$31,250
CCOF	University of Wyoming	\$31,250		\$31,250
Total		\$125,000	\$125,000	\$250,000

Scope: The Local Technical Assistance Program (LTAP) is part of the Federal Highway Administration's Technology Transfer Program. LTAP creates a process using Technology Transfer (T²) Centers to transfer research findings and new technology to the local-level end-user. T² Centers have been established in each state to provide information, advice, and training to local agencies, with Wyoming's T² Center being established in 1985 at the University of Wyoming.

Wyoming Statute 21-17-115 states that:

The University of Wyoming may operate a technology transfer center and provide training to Wyoming county and municipality employees regarding current trends in transportation technology.

The state portion of the funding comes from equal contributions from WYDOT; counties (Wyo. Stat. 24-2-110); cities and towns (Wyo. Stat. 39-17-111(d)(iii)(A)); and the University of Wyoming in an annual amount no less than \$25,000 and a maximum of \$31,250. The federal government or other non-state contribution must equal that of the total state portion.

2.4 Local Technical Assistance Program (LTAP) at University of Wyoming

Identification: RS01(217)

Contacts:	Principal Investigator:	WYDOT Representative:
	Khaled Ksaibati, P.E., Ph.D	Tim McDowell, P.E.
	307-766-6230	307-777-4177
	University of Wyoming	WYDOT Programming
	Laramie WY 82071	5300 Bishop Blvd.
		Cheyenne WY 82009

Funding Summary:

<i>Code</i>	<i>Funds</i>	<i>State Portion</i>	<i>Federal Portion</i>	<i>Budgeted 2017</i>
RS01217	Federal		\$30,000	\$30,000
	State Match	\$7,500		\$7,500
Total		\$7,500	\$30,000	\$37,500

Scope: The Technology Transfer Center (T²) is part of the Federal Highway Administration's Technology Transfer Program. The T² Center transfers research findings and new technology to the local-level end-user. T² Centers have been established in each state to provide information, advice, and training to local entities.

2.5 Administration of Research

Identification: RES2217

Contacts: WYDOT Representative:
 Enid White, Research Manager
 307-777-4182
 WYDOT Research Center
 5300 Bishop Blvd
 Cheyenne WY 82009

Funding Summary: *(Project RES2217, Activity RES0)*

Title	State Portion	Federal Portion	Budgeted 2017
Research Proposal Development	\$1,000	\$4,000	\$5,000
Research Printing	\$100	\$400	\$500
Research Office Supplies	\$150	\$600	\$750
Vehicle Usage	\$100	\$400	\$500
Research Library Materials	\$200	\$800	\$1,000
RAC Administration	\$9,100	\$36,400	\$45,500
Research Presentation	\$1,000	\$4,000	\$5,000
Travel	\$1,100	\$4,400	\$5,500
National RAC Meeting	\$70	\$280	\$350
Employee Time Charges and Leave	\$14,107	\$56,427	\$70,534
Contract Management and Misc	\$800	\$3,200	\$4,000
Professional Fees	\$65	\$260	\$325
TOTAL	\$27,792	\$111,167	\$138,959

2.6 - Pooled Fund Projects Funding Summary

	Obligated 1995-2011	Obligated 2012	Obligated 2013	Obligated 2014	Obligated 2015	Obligated 2016	Total Obligated
TPF-5(054) Development of Maintenance Decision Support System	\$200,000	\$25,000		\$25,000			\$250,000
TPF-5(193) Midwest States Regional Pooled Fund Project	\$360,000						\$360,000
TPF-5(218) Clear Roads Winter Highway Operations Pooled Fund (continued from TPF-5(092))	\$125,000						\$125,000
TPF-5(253) Member-Level Redundancy in Built-up Steel Members	\$75,000						\$75,000
TPF-5(310) – 11th Annual International Conference on Low Volume Roads and Peer Exchange					\$8,000		\$8,000
TPF-5(317) Evaluation of Low Cost Safety Improvements						\$30,000	\$30,000
TPF-5(310) Peer Exchange						\$5,902	\$5,902
TPF-5(337) Avalanche Research Pooled Fund						\$75,000	\$75,000

Notes: Pooled Fund research projects are generally 100 percent Federal funds.

2.6.1 – TPF-5(054) Development of Maintenance Decision Support System

Contacts: Lead Agency Contacts: WYDOT Representative:
 Dave Huft Jeff Frazier, P.E.
 South Dakota DOT Field Operations, WYDOT
 605-773-3358 5300 Bishop Blvd.
 Cheyenne WY 82009
 Investigator: 307-777-4052
 Leono@meridan-enviro.com

Period of Study: Proposal Approved: July 2005
Estimated Completion: October 2017

Scope: The purpose of this study was to develop a system capable of integrating accurate weather forecasts, road condition reports, and maintenance resource information so proactive maintenance decisions can be made before and during adverse weather events, resulting in a higher level of service, reduced operational costs, and safer highway conditions.

Status: Each district in Wyoming has several roads with MDSS sites and is using the information gathered as a tool in determining snow removal procedures. The software being developed for commercial use has many variables allowing each user state to input equipment and chemical parameters available for each road condition and the software will generate snow removal recommendations for that condition. Unfortunately, due to the lack of funding only a few roads in Wyoming are currently benefitting from this study. Additional funding of \$25,000 was approved for 2012 but was never obligated. These funds came from the 2014 budget.

This Project is scheduled to close in October of 2017. WYDOT no longer provides funds for this project, but does benefit from the research being conducted.

**2.6.3 – TPF-5(218) Clear Roads Winter Highway Operations Pooled Fund
(continued from TPF-5(092))**

Contacts:	Lead Agency Contact: Debra Fick Minnesota Department of Transportation deb.fick@dot.state.mn.us Phone: 651-366-3759	WYDOT Representative: Cliff Spoonemore, P.E. WYDOT Maintenance 5300 Bishop Blvd. Cheyenne WY 82009 307-777-6377
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Period of Study: Proposal Approved: October 2006
Estimated Completion: Ongoing

Scope: The Clear Roads pooled fund project began in 2004 with four members and a focus on real world testing of winter maintenance materials, methods, and equipment. During its five years of funding and overseeing research projects, the pooled fund grew to include fourteen member states funding two or three research projects annually. As the group grew, however, there was much interest in expanding the project scope to include more technology transfer and direct support for staff in the field. The group proposed to close the original pooled fund project (TPF-5-092) and requested funding and support for a new Clear Roads project with this solicitation. See the Clear Roads Web site at www.clearroads.org for both the history and latest information on this project.

This new Clear Roads pooled fund project will maintain its focus on advancing winter highway operations nationally but will include a more pronounced emphasis on state agency needs, technology transfer, and implementation. State departments of transportation are aggressively pursuing new technologies, practices, tools, and programs to improve winter highway operations and safety while maintaining fiscal responsibility. This pooled fund is needed to evaluate these new tools and practices in both lab and field settings, to develop industry standards and performance measures, to provide technology transfer and cost benefit analysis and to support winter highway safety. This project responds to research and technology transfer needs not currently met by other pooled fund projects. Existing partners make every effort to coordinate with other agencies to avoid duplication of efforts and to encourage implementation of results.

Status: The WYDOT RAC voted not to fund this project in 2015.

2.6.4 – TPF-5(253) Member Level Redundancy in Built-up Steel Members

Contacts: Lead Agency Contact: WYDOT Representative:
Indiana DOT WYDOT Bridge
Division of Research 5300 Bishop Blvd
Tommy Nantung Cheyenne WY 82009
tnantung@indot.in.gov 307-777-4427
Phone: 765-463-1521 ext 248

Period of Study: Proposal Approved: January 2011
Estimated Completion: May 2018

Scope: The objective of this research project is to quantify the redundancy possessed by built-up members. For example, a riveted built-up member will not typically “fail” if one of the components fractures. However, there is very little experimental data which is available to quantify the remaining fatigue life or strength of a member in which one of the components has failed. Furthermore, if built-up members are located in bridges classified as fracture critical, when significant member redundancy can be shown, the bridge may not need to be classified as FC. However, doing so would release these members from the more rigorous arms-length inspection currently required. As a result, should a component fail, it may go undetected for an extended interval. Thus, a portion of the project is devoted to setting rational inspection intervals for these members. Lastly, the advantages of using built-up members fabricated with HPS Components fastened using HS bolts in new construction will also be explored.

Status: Conducted fracture test on specimen 30-1 with thicker (1”) cover plate; conducted fatigue test on specimen 30-1; continued work on FE analysis; developed simplified models for characterization of load distribution of partially failed build up; developed draft of evaluation of guidelines for build-up members in bending; began assembly of 2 million pound testing machine; and reassembled west test setup load frame with repaired MTS actuator.

2.6.5 – TPF-5(310) 11th International Conference on Low Volume Roads and Peer Exchange

Contacts:	Lead Agency Contact:	WYDOT Representative:
	Iowa DOT	Jeff Brown, P.E.
	Vanessa Goetz	5300 Bishop Blvd
	Vanessa.goetz@dot.iowa.gov	Cheyenne WY 82009
	Phone: 515-239-1382	307-777-4134

Period of Study: Proposal Approved: April 2015
Estimated Completion: July 15, 2015

Scope: The Iowa Department of Transportation (Iowa DOT) served as lead state for the execution of this Pooled Fund project. The Transportation Research Board (TRB) facilitated administrative duties associated with the project and managed the invoices for reimbursement up to the amount available in the Pooled Fund.

Status: This project was completed in 2015, but the project is still open on the Pooled Fund site.

2.6.6 – TPF-5(317) Evaluation of Low Cost Safety Improvements

Contacts: FHWA: WYDOT Representative:
Roya Amjadi Joel Meena
Roya.amjadi@fhwa.dot.gov 5300 Bishop Blvd
202-493-3383 Cheyenne WY 82009
307-777-4374

Period of Study: Proposal Approved: April 2015
Estimated Completion: 2017

Scope: This project is being created to convert Pooled Fund Project TPF-5(099) to the “New” Pooled Fund Procedures. The scope of the ELCSI–PFS is to conduct a research project of the priority strategies in the NCHRP Report 500 Guides. Originally, a target of 20 strategies totaling \$4.38 million over five years was planned for ELCSI–PFS studies in four phases. Currently, this study has outperformed its original goals, and has added four extra phases for a total of eight phases. The original budget of \$4.38 million remains the same. To provide much needed reliability measures for effectiveness of various low-cost safety improvements, this study's performance period has been extended beyond 2017.

Status: This is a continuing project.

2.6.7 – TPF-5(310) Support Services for Peer Exchange

Contacts: FHWA: Leslie Wright
Leslie.Wright@dot.gov
202-493-3383

Lead Contact:
Michael Bufalino
503-986-2845
Oregon Department Of Transportation

Period of Study: Proposal Approved: October 2014
Estimated Completion: June 30, 2019

Scope: The Peer Exchange has been a requirement for state RD&T programs since 1998 and it has proven to be a useful and effective tool for improving research program management. However, for many states the most difficult aspect of hosting a peer exchange is logistics and procurement. Beginning in 2006, the AASHTO Research Advisory Committee established a task force on Peer Exchanges. Over the next few years, the Task Force surveyed membership, discussed issues in depth, and made recommendations to FHWA for an update in Peer Exchange Guidance. Among those recommendations was that the Pooled Fund program should be made available to support peer exchange planning, and logistics and procurement. FHWA representatives participated in the discussions of the Peer Exchange Panel, and supported those Task Force recommendations, including this one. WYDOT's Research Center used this Pooled Fund for a Peer Exchange in FY2016.

Status: WYDOT's Peer Exchange was completed in FY2016.

2.6.8 – TPF-5(337) Avalanche Research Pool

Contacts:	David Reeves Colorado DOT David Reeses@state.co.us 303-757-9518	Lead Contact: Jamie Yount WYDOT Jackson WY
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Period of Study: Proposal Approved: November 2015
Estimated Completion: Unknown

Scope: The study's mission is to support collaborative research efforts in the field of avalanche hazard assessment and mitigation, with the goal of improving the safety, efficiency, and quality of control efforts, along with providing better information gathering and analysis techniques and seamless integration of new technologies to further these goals. The participation of many transportation related agencies in this study will also further cooperation in this industry, leading to improved future development of beneficial technologies and improved sharing of information and avalanche data, greatly furthering the safety, efficiency, and quality of the work done in this field for all relevant agencies.

Status: The first project conducted was assessing the Gazex Avalanche Control Effectiveness with Terrestrial Laser Scanning.

2.7 - State Research Projects Funding Summary (Obligated)⁵

<i>Project Number</i>	<i>Title</i>	Contract Amount	Obligated 2012-2015	Obligated 2016	Obligated 2017	Estimated ICAP Funds (8.23% total contract)	Estimated ICAP Funds (11% total contract)
RS06(211)	Comprehensive Technology Assessment for Avalanche Hazard Management: Developing and applying an avalanche hazard technology optimization process to a case study on U.S. Route 189-191, in Hoback Canyon, Wyoming	\$344,428	\$372,775			\$28,347	
RS04(212)	Evaluation of a Mitigation Site: Amphibian Population	\$86,562	\$93,686			\$7,124	
RS07(212)	Jackson South Snow Supporting Structures Proposed Performance and Health Monitoring of WYDOT Project No. N104085, Teton County, Jackson, Wyoming	\$104,566	\$113,172			\$8,606	
RS04(213)	Characterization of Material Properties for Mechanistic Empirical Pavement Design in Wyoming	\$317,759	\$343,991			\$26,152	
RS03(214)	Assessment and Evaluations of I-80 Truck Loads and Their Load Effects	\$206,931	\$223,961			\$17,030	
RS05(214)	Safety Effectiveness of Regulatory Headlights Signs in Wyoming	\$95,592	\$103,460			\$7,868	
RS02(215)	Evaluating Effectiveness of Fly Ashes to Mitigate ASR	\$65,975	\$71,405			\$5,430	
RS05(215)	Developing Mitigation Strategies to Reduce Truck Crash Rates on Wyoming Highways	\$89,181	\$96,521			\$7,340	
RS06(215)	Historic Winter Weather Assessment for Snow Fence Design Using a Numerical Weather Model	\$19,178	\$20,756			\$1,578	
RS02(216)	Characterization of Crushed Bases in Wyoming	\$64,577		\$69,892		\$5,315	
RS03(216)	Calibrating Crash Modification Factors for Wyoming-Specific Conditions: Application of the Highway Safety Manual – Part D	\$79,234		\$85,755		\$6,521	
RS04(216)	Traffic Thresholds in Deer Road Crossing Behavior	\$36,960		\$40,002		\$3,042	
RS05(216)	Wyoming Low Volume Roads Traffic Volume Estimation: Phase 2 *See explanation on P. 46 for full breakdown for funds.	\$119,100		\$0.00		\$0.00	
RS06(216)	Development of Load and Resistance Factor Design Procedures for Driven Piles on Soft Rocks in Wyoming	\$160,372		\$173,571		\$13,199	
RS07(216)	Driver Performance and Behavior in Adverse Weather Conditions: In Investigation using SHRP2 Naturalistic Driving Study Data *See explanation on P. 48 for full breakdown for funds.	\$150,000		\$150,000		\$0.00	
RS08(216)	Updating and Implementing the Grade Severity Rating System (GSRS) for Wyoming Mountain Passes	\$157,004		\$169,925		\$12,921	

⁵ Unless stated otherwise, all projects receive 80% federal funding and 20% state funding.

<i>Project Number</i>	<i>Title</i>	Contract Amount	Obligated 2012-2015	Obligated 2016	Obligated 2017	Estimated ICAP Funds (8.23% total contract)	Estimated ICAP Funds (11% total contract)
RS09(216)	Design and Performance Evaluation of a SemiFlexible Snow Barrier for Avalanche Protection	\$138,781		\$150,203		\$11,422	
RS10(216)	Last Mile Commercial Package Delivery as a Revenue Generation Tool for Rural Public Transportation Systems in Wyoming. *See explanation on P. 51 for full breakdown for funds.	\$40,143		\$43,447		\$3,304	
RS11(216)	Effectiveness of Nighttime Speed Limit Reduction in Reducing Wildlife Vehicle Collisions	\$250,026		\$270,603		\$20,577	
RS02(217)	Structural Health Monitoring of Highway Bridges Subjected to Overweight Vehicles, Phase II – Field Deployment	\$220,374			\$244,615		\$24,241
RS03(217)	Development of an Ultra-Accelerated test to Evaluate ASR Potential in Concrete	\$192,850			\$214,064		\$21,214

2.7.1 – RS06(211) A Comprehensive Technology Assessment for Avalanche Hazard Management: Developing and applying an avalanche hazard technology optimization process to a case study on US Route 189-191 in Hoback Canyon, Wyoming



Contacts:	Principal Investigator:	WYDOT Representative:
	Rand Decker, Ph.D., P.E.	Tory Thomas
	Rand Decker, Sole Proprietor	District 3
	83 El Camino Tesoros	Rock Springs, WY
	Sedona, Arizona 86336	307-352-3031
	928-202-8156	

Period of Study: Proposal Approved: October 2012
 Estimated Completion: September 2015
 First Revised Contract: September 2017

Funding Summary:

Total Contract, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$344,428	2013	\$254,928	\$74,555	\$28,347	\$0.00
	2014	\$43,292			

Scope: Develop a generic, broadly applicable, structured process to optimize the choice of avalanche hazard management methods and technology for a given roadway application, including an assessment of the state-of-the-art TAS O’BELLX portable, remotely operable gas blaster for active avalanche control.

Status: The Buy America Waiver, which approved Federal funds to be used to purchase the TAS O’BELLX gas blaster, took over a year to be finalized and delayed the project. The TAS OBELLX has been installed and test fired. The project was extended to 2017 and is about 80 percent complete.

2.7.2 – RS04(212) Evaluation of a Mitigation Site: Amphibian Population



Contacts:	Principal Investigator:	WYDOT Representative:
	Erin Muths	Bob Bonds
	U.S. Geological Survey	Environmental Coordinator
	2150 Centre Ave. Bldg C	5300 Bishop Blvd
	Fort Collins, CO 80526	Cheyenne WY 82009
	970-226-9474	307-777-4364

Period of Study: Proposal Approved: May 2012
 Estimated Completion: May 2017

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$86,562	2012	\$74,949	\$18,737	\$7,124	\$0.00

Scope: Quantify the success of a mitigation site for amphibian species and compare the results between other wetland mitigation sites. The results will provide information for future mitigation efforts in this and similar types of habitat and provide evidence of successful wetland mitigation efforts.

Status: The Principle Investigator hired and deployed a two-person field crew to Black Rock from May through July of 2015. Photos and data were collected, and are being analyzed. Data management and analysis was completed during the fall of 2015 and the spring of 2016. Additional funding was secured through the University of Montana College of Forestry and Conservation, and OnXmaps. The final report will be completed in May of 2017 after another year of data is gathered.

**2.7.3 – RS07(212) Jackson South Snow Supporting Structures Proposed
Performance and Health Monitoring of WYDOT Project No. N104085, Teton
County, Jackson, Wyoming**



Contacts: Principal Investigator: Joshua Hewes, Ph.D.
InterAlpine, Associates, LLC
83 El Camino Tesoros
Sedona, AZ 86336

WYDOT Representative: Jamie Yount
District 3
307-733-3126

Period of Study: Proposal Approved: September 2012
Estimated Completion: September 2017

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$113,172	2013	\$98,347	\$24,587	\$8,606	\$0.00

Scope: Evaluate the performance of the milepost 151 snow supporting structure installation, and provide an initial basis for development of design guidelines for future constructed snow defense measures at other locations within the western United States. The project will also design parameters and establish domestic guidance documents.

Status: After a delay due to foundation issues, the instrumentation has been placed and the project is moving forward. The instrument array is now 100 percent complete and functioning as intended. The project is currently on schedule.

2.7.4 – RS04(213) Characterization of Material Properties for Mechanistic-Empirical Pavement Design in Wyoming

Contacts:	Principal Investigator:	WYDOT Representative:
	Dr. Kam Ng, Ass't Professor	Bob Rothwell
	Dr. Khaled Ksaibati, Professor	WYDOT Materials Program
	University of Wyoming	5300 Bishop Blvd
	Laramie Wyoming 82071	Cheyenne WY 82009
	307-766-4333	
	307-766-6220	

Period of Study: Proposal Approved: March 2013
 Estimated Completion: December 2016

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$317,759	2013	\$119,905	\$69,605	\$30,267	\$50,010
	2014	\$80,000			
	2015	\$118,524			

Scope: The project is set up to characterize representative local material properties for unbound base and subgrade layers for the mechanistic-empirical pavement design in Wyoming.

Status: This project is 87 percent complete at this time. Three papers have been submitted to major publications for this project, and the results have been disseminated at three different conferences. Three theses were defended at the University of Wyoming in the spring of 2015. The final report should be complete in December of 2016.

2.7.5 – RS03(214) Assessment and Evaluations of I-80 Truck Loads and Their Load Effects



Contacts:	Principal Investigator:	WYDOT Representative:
	Dr. Jay Puckett, P.E.	Michael Menghini
	Brian Goodrich, P.E.	WYDOT Bridge
	302 S. 2 nd Street, St. 201	5300 Bishop Blvd
	Laramie WY 82071	Cheyenne WY 82009
307-721-5070	307-777-4427	

Period of Study: Proposal Approved: October 2013
 Estimated Completion: December 2015

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$206,931	2014	\$179,169	\$44,792	\$17,030	\$0.00

Scope: This project shall determine whether: a) the FHWA requirements outlined in the September 29, 2011 memorandum are being met; b) the current legal loads compare to Wyoming weigh-in-motion (WIM) data and vehicles allowed by state statute; c) the WIM and current legal loads compare to the AASHTO LRFRL Legal/Raging Loads; and d) the accumulative damage effects of large loads on I-80 begin to be qualified.

Status: The Principle Investigator has finished all work and is preparing the final report. The final report will be completed in December of 2016.

2.7.6 – RS05(214) Safety Effectiveness of Regulatory Headlights Signs in Wyoming



Contacts: Principal Investigator: Dr. Mohamed M. Ahmed
 Dr. Khaled Ksaibati, P.E.
 University of Wyoming
 Laramie Wyoming 82071
 307-766-6230

WYDOT Representative: Matt Carlson
 WYDOT
 5300 Bishop Blvd
 Cheyenne WY 82009
 307-777-4195

Period of Study: Proposal Approved: July 9, 2014
 Estimated Completion: June 30, 2019

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$95,592	2014	\$82,767	\$20,692	\$7,867	\$0.00

Scope: U.W. shall perform a synthesis of existing research studies of the dynamic message signs (DMS) safety benefits; identify and rank hotspot locations of lane departure crashes, head-on and opposite sideswipe crashes on Wyoming roadways; evaluate the safety effectiveness of daytime running lights (DRL) using Wyoming crash data for DRL-equipped and non-DRL vehicles, and motorcycles; conduct a field study on current headlight signed hotspot locations to collect data about the compliance of DRL use and the newly 24-hour low beam lights in newer vehicles; develop a plan for state wide sign implementation; conduct a cost/benefit analysis; conduct a driving simulation experiment; field test the experiment; and finalize state wide implementation and cost/benefit analysis.

Status: Phase 2 of the project has been completed. Phase 1, which is not funded with SP&R funds, is scheduled to be completed in June of 2019. The final report for Phase 2 was published in January of 2016.

2.7.7 – RS02(215) Evaluating the Effectiveness of Fly Ashes to Mitigate ASR and Using Recycled Concrete Aggregate in New Construction



Contacts:	Principal Investigator:	WYDOT Representative:
	Jennifer Tanner	Chris Romo
	University of Wyoming	WYDOT
	Laramie Wyoming 82071	5300 Bishop Blvd
	307-766-2073	Cheyenne WY 82009
		307-777-4074

Period of Study: Proposal Approved: Nov. 19, 2014
 Estimated Completion: Sept. 30, 2018

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$65,975	2015	\$57,124	\$14,281	\$5,430	\$0.00

Scope: U.W. shall conduct tests on fly ashes; evaluate moderately reactive, reactive and highly reactive aggregates; conduct concrete prism testing; demolish blocks and make recycled concrete aggregate; and continue monitoring field specimens.

Status: The project is about 30 percent complete. The Principle Investigator has completed autoclave work; performed repeat tests on HP-F, DF-F, and DF-C; performed Brighton control CPT; and conducted a more comprehensive statistical analysis on the RCA AMBT interlab study.

2.7.8 – RS05(215) Developing Mitigation Strategies to Reduce Truck Crash Rates on Wyoming Highways



Contacts: Principal Investigator: Khaled Ksaibati
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 307-766-6230

WYDOT Representative: Matt Carlson
 5300 Bishop Blvd
 Cheyenne WY 82009
 307-777-4195

Period of Study: Proposal Approved: May 21, 2015
 Estimated Completion: June 30, 2017

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$89,181	2015	\$77,217	\$19,304	\$7,340	\$0.00

Scope: Principal Investigators shall perform a comprehensive literature review; collect statewide crash data and perform analysis on three (3) zones; collect data on statewide citations issued by the Wyoming Highway Patrol (WHP) for motor carriers; review WHP policies and strategies for enforcement; compare relevant crash data and citations issued; develop GIS maps for crash locations and citation locations; meet with WHP representatives; review WHP resources; conduct a survey regarding funding contribution levels; and review Red Flag Violations and Crash Predictor Violations.

Status: This project is 50 percent complete. The ongoing work with the Highway Patrol is in the early stages. The final report findings will be presented to the Wyoming Safety Coalition, WYDOT, and the Wyoming Highway Patrol near the completion of the project.

2.7.9 – RS06(215) Historic Winter Weather Assessment for Snow Fence Design Using a Numerical Weather Model



Contacts:	Principal Investigator:	WYDOT Representative:
	Noriaki Ohara	Kathy Ahlenius
	University of Wyoming	Clifford Spoonemore
	Laramie WY 82071	5300 Bishop Blvd Cheyenne WY 82009 307-777-4264

Period of Study: Proposal Approved: September 11, 2015
 Estimated Completion: February 28, 2017

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$19,178	2015	\$16,605	\$4,151	\$1,578	\$0.00

Scope: Principal Investigators shall work with WYDOT to revise wind and winter precipitation tables for snow fence design using the WRF model; compare the existing wind and winter precipitation table, hereinafter referred to as the “Tabler Table” (©1997 Ronald D. Tabler. All rights reserved, and which became the property of WYDOT by written agreement dated February 14, 1994), with new data gathered by WYDOT and U.W. to gauge any significant changes in the data currently housed in the Tabler Table; assist WYDOT in setting up policies and practices which revolve around the Tabler Table regarding updates, archiving, implementation, and use of the wind and winter precipitation data.

Status: The project is 70 percent complete. During this reporting period, the 4 km WRF model has been implemented. Principle Investigator completed 200 winter-condition weeks of the simulation that cover about 70 percent of the blowing snow periods. The blowing snow periods were identified based on the outputs of the numerical weather model simulation results for the period of 1980-2014 at 12 km spatial resolution over Wyoming.

2.7.10 – RS02(216) Characterization of Crushed Bases



Contacts: Principal Investigators: Kam Ng
Khaled Ksaibati
University of Wyoming
Laramie WY 82071
307-766-6230

WYDOT Representative: Ryan Steinbrenner
Mike Farrar
5300 Bishop Blvd
Cheyenne WY 82009

Period of Study: Proposal Approved: October 2015
Estimated Completion: January 31, 2018

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$64,577	2016	\$55,914	\$13,978	\$5,315	\$0.00

Scope: The proposed research serves as a complementary study to enhance the pavement design in Wyoming through the characterization of base materials. The research project has the following objectives: 1) characterize the properties of local base materials; 2) understand the effects of rock type, moisture content, fine content, and gradation of base modulus; 3) improve base modulus estimations; and 4) facilitate the full MEPDG implementation in the State of Wyoming.

Status: The project is 77 percent complete. During this reporting period, a kick-off meeting was conducted; local base materials and determine properties were identified; reasonable resilient modulus values were measured for base materials obtained from four pits; and all resilient modulus values were met.

2.7.11 – RS03(216) Calibrating Crash Modification Factors for Wyoming Specific Conditions: Application of the Highway Safety Manual – Part D



Contacts: Principal Investigators: Mohamed Ahmed
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Laramie WY 82071
307-766-5550

WYDOT Representative: Matt Carlson
5300 Bishop Blvd
Cheyenne WY 82009

Period of Study: Proposal Approved: October 2015
Estimated Completion: April 30, 2017

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$79,234	2016	\$63,604	\$17,151	\$6,521	\$0.00

Scope: The Highway Safety Manual provides CMFs for roadway segments, intersections, interchanges, special facilities, and road networks. CMFs could be applied individually, if a single treatment is proposed, or multiplicative, if multiple treatments are implemented. In this study, the Empirical Bayes (EB) approach to analysis before-after effects will be utilized. The EB method can overcome the limitations faced by simple before-after evaluation and compare group methods by not only accounting for egression to the mean effects, but also accounting for traffic volume changes when identifying the crash modifications.

Status: The project is 34 percent complete. The literature review is ongoing for this project. Data collection has been completed for roadway segments: 1) passing lanes for 2-lane highways, climbing lanes for freeways, and access management for arterial management and widening and overlay for 2-lay highways; 2) intersections; and 3) special facilities – variable speed limit and snow fences. Safety performance functions have been calibrated for two-way two-lane highways. Simple before-after studies have been conducted.

2.7.12 – RS04(216) Traffic Thresholds in Deer Road-Crossing Behavior



Contacts: Principal Investigators: WYDOT Representative:
Corinna Riginos Pete Hallsten
Northern Rockies Conservation 218 West C Street
Jackson WY Basin WY
307-568-3413

Period of Study: Proposal Approved: October 2015
Estimated Completion: May 31, 2017

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$36,960	2016	\$32,002	\$8,000	\$3,042	\$0.00

Scope: The overarching objective is to provide transportation planners with information that will help them to evaluate the placement of wildlife-vehicle mitigation measures. This should increase the cost effectiveness of mitigation measures and will be vital to reducing the rising problem of wildlife vehicle collisions while maintaining and enhancing landscape connectivity for wildlife in Wyoming.

Status: The project is 33 percent complete. Traffic counts and behavior observations of deer on video footage has been completed, and the data is being analyzed.

2.7.13 – RS05(216) Wyoming Low Volume Roads Traffic Volume Estimation, Phase II



Contacts:	Principal Investigators:	WYDOT Representative:
	Khaled Ksaibati	Martin Kidner
	University of Wyoming	Mark Wingate
	Laramie WY 82071	5300 Bishop Blvd
	307-766-6230	Cheyenne WY 820091

Period of Study: Proposal Approved: This project was not approved by the RAC and does not use SP&R funds, but is managed by the Research Center
 Estimated Completion: February 29, 2018

Funding Summary:

Total Contract	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Funds / Planning
\$119,100	2016	\$0.00	\$0.00	\$0.00	\$119,100

Scope: There are three basic goals of this project. First, the travel demand model developed in Phase 1 will be enhanced by including oil and gas impacts in the model and improving the transportation analysis zone delineation of the study location. Second, implementation of the model for the remaining 19 counties in Wyoming will be conducted. Finally, an analysis will be carried out to determine the length of time over which estimates can be considered valid and when to update the model to improve accuracy of results to account for traffic variations in the future.

Status: The model development process from Phase 1 has been reviewed. Laramie County was selected for perfecting a simple and easy way to implement TAZ delineation methods. Though special generators such as oil and gas wells were not considered in the travel demand for Phase 1, the current study requires daily trip rates for a typical well to estimate average daily trips generated by a zone in the four-step modeling process. Road network data obtained for the Tiger/Lines webpage of the US Census is being developed to represent the transportation system in each county.

2.7.14 – RS06(216) Development of Load and Resistance Factor Design Procedures for Driven Piles on Soft Rocks in Wyoming



Contacts: Principal Investigators: Khaled Ksaibati
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 Laramie WY 82071
 307-766-6230

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 5300 Bishop Blvd
 Cheyenne WY 82009
 307-777-4205

Period of Study: Proposal Approved: January 2016
 Estimated Completion: December 2018

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$160,372	2016	\$138,857	\$34,714	\$13,199	\$0.00

Scope: The overall goal of the proposed research project is to develop locally calibrated LRFD procedures for driven piles of soft rocks in Wyoming. Recognizing the design and construction challenges of piles driven on soft rocks, the research project is proposed to accomplish the following: a) advance the knowledge of design and construction of piles driven on soft rocks; b) alleviate the aforementioned design and construction challenges; and c) advance the current state of practice pertaining to the design and construction of piles of soft rocks in Wyoming.

Status: The project is in the early stage and no progress reports have been received.

2.7.15 – RS07(216) Driver Performance and Behavior in Adverse Weather Conditions: An Investigation using SHRP2 Naturalistic Driving Study Data



Contacts:	Principal Investigators:	WYDOT Representative:
	Khaled Ksaibati	Tim McDowell
	University of Wyoming	5300 Bishop Blvd
	Laramie WY 82071	Cheyenne WY 82009
	307-766-6230	

Period of Study: Proposal Approved: January 2016
 Estimated Completion: March 2018

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$150,000	2016	\$120,000	\$30,000	\$0.00	\$112,274 from SHRP2

Scope: WYDOT and the University of Wyoming have completed a proof-of-concept utilizing a sample NDS data set and the Roadway Information Database. The main goal of this study is to enhance the understanding of how drivers respond to adverse weather and road conditions.

Status: The project is in the early stage and no progress reports have been received.

2.7.16 – RS08(216) Updating and Implementing the Grade Severity Rating System (GSRS) for Wyoming Mountain Passes



Contacts:	Principal Investigators:	WYDOT Representative:
	Khaled Ksaibati	James Evensen
	Dick Apronti	Joel Meena
	University of Wyoming	Matt Carlson
	Laramie WY 82071	5300 Bishop Blvd
307-766-6230	Cheyenne WY 82009	

Period of Study: Proposal Approved: April 2016
 Estimated Completion: January 2019

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$157,004	2016	\$135,940	\$33,958	\$12,921	\$0.00

Scope: The study is aimed at achieving two main goals. First, the FHWA’s GSRS model will be updated to reflect the current truck population characteristics. This will be achieved by carrying out field tests with an instrumented vehicle to update parameters in the model that reflect current truck characteristics and braking systems. The second objective of the study is to evaluate Wyoming mountain passes and their warning systems with regard to truck downgrade crashes. By doing this, the best means of communicating with truck drivers to reduce the probability of runaway truck incidences can be recommended.

Status: The project is in the early stage and no progress reports have been received.

2.7.17 – RS09(216) Design and Performance Evaluation of a Semiflexible Snow Barrier for Avalanche Protection



Contacts: Principal Investigators: Josh Hewes
InterAlpine Engineers
24 West Quartz Rd
Flagstaff AZ 86005

WYDOT Representative: Jamie Yount
WYDOT
Jackson WY

Period of Study: Proposal Approved: April 2016
Estimated Completion: December 2019

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$138,781	2016	\$120,162	\$30,041	\$11,422	\$0.00

Scope: The objectives of this study are to provide the necessary background information that will describe the relative performance of SSU in their ability to effectively mitigate the risk of avalanche release from the starting zone. The work will also provide a framework for engineers that will help guide them through each step of the design process on future projects where SSU are utilized on a larger scale to minimize avalanche danger to motorists.

Status: The project is in the early stage and no progress reports have been received.

2.7.18 – RS010(216) Last Mile Commercial Package Delivery as a Revenue Generation Tool for Rural Public Transportation System in Wyoming



Contacts:	Principal Investigators: Jaydeep Chaudhari Western Transportation Institute Bozeman MT 59717	WYDOT Representative: Talbot Hauffe 5300 Bishop Blvd Cheyenne WY 82009
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Period of Study: Proposal Approved: July 2016
 Estimated Completion: October 2017

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$40,143	2016	\$34,758	\$8,689	\$3,304	\$80,660 WTI Match

Scope: The goal of this project is to assess the feasibility of last mile package delivery as a revenue generation tool for rural public transportation systems in Wyoming. The objectives are a) understand the impact of technologies and innovative last mile package delivery systems; b) synthesize current last mile package delivery practices in public transportation systems in rural states; c) analyze policies of states regarding the use of public transportation for package delivery; and d) estimate demand, capacity need, and revenue generation for rural transit systems in regard to last mile package delivery.

Status: The project is in the early stage and no progress reports have been received.

2.7.19 – RS011(216) Effectiveness of Nighttime Speed Limit Reduction in Reducing Wildlife Vehicle Collisions



<p>Contacts:</p>	<p>Principal Investigators: Corinna Riginos Northern Rockies Conservation Jackson WY</p> <p>Marcel Huijser Western Transportation Institute Bozeman MT</p>	<p>WYDOT Representative: Keith Compton District 3, WYDOT Rock Springs WY 307-352-3031</p>
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Period of Study: Proposal Approved: July 2016
 Estimated Completion: January 2019

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 8.23% 80/20 split	Other Match Funds or Internal Funds
\$250,026	2016	\$216,482	\$54,121	\$20,577	\$0.00

Scope: The overarching objective is to provide transportation planners with scientifically defensible and robust information about whether reducing nighttime speed limits is an effective means of reducing vehicle collisions with wildlife.

Status: The project is in the early stage and no progress reports have been received.

2.7.20 – RS02(217) Structural Health Monitoring of Highway Bridges Subjected to Overweight Vehicles, Phase II – Field Deployment



<p>Contacts:</p>	<p>Principal Investigators: Johnn Judd, Ph.D., S.E. Michael Barker, Ph.D., P.E University of Wyoming 1000 East University Avenue Laramie WY 82071</p>	<p>WYDOT Representative: Paul Cortez, P.E. WYDOT 5300 Bishop Blvd Cheyenne WY 82009</p>
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Period of Study: Proposal Approved:
 Estimated Completion: December 2018

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 11% 80/20 split	Other Match Funds or Internal Funds
\$220,374	2017	\$195,692	\$48,923	\$24,241	\$0.00

Scope: The preliminary research in Phase I of this project demonstrated that the fiber Bragg grating (FBG) based sensor structural health monitoring (SHM) system is a viable concept with the potential to be implemented and to provide valuable data on bridge performance. In Phase II of the project, the FBG-based SHM system will be deployed and operated in the field.

Status: The project has not been signed by all parties and is not open yet.

2.7.21 – RS03(217) Development of an Ultra Accelerated Test to Evaluate ASR Potential in Concrete



<p>Contacts:</p>	<p>Principal Investigators: Jennifer Tanner, Ph.D., P.E. University of Wyoming 1000 East University Ave. Laramie WY 82071</p>	<p>WYDOT Representative: Chris Romo, P.E. Bob Rothwell, P.E. Greg Milburn, P.E. WYDOT 5300 Bishop Blvd. Cheyenne WY 82009</p>
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Period of Study: Proposal Approved:
 Estimated Completion: September 2020

Funding Summary:

Total Contract, Amendment, and Revisions	Fiscal Year	Federal	State Match	ICAP 11% 80/20 split	Other Match Funds or Internal Funds
\$192,850	2016	\$172,051	\$43,013	\$22,214	\$0.00

Scope: A proposed test could potentially replace the year long concrete prism test with a week long test for evaluation of combinations of coarse and fine aggregates. The primary goal of this project is cost savings by producing durable concrete with an extended service life.

Status: The project has not been signed by all parties and is not open yet.

